

TLP2631

ISOLATED LINE RECEIVER

SIMPLEX/MULTIPLEX DATA TRANSMISSION

COMPUTER-PERIPHERAL INTERFACE

MICROPROCESSOR SYSTEM INTERFACE

DIGITAL ISOLATION FOR A/D, D/A CONVERSION

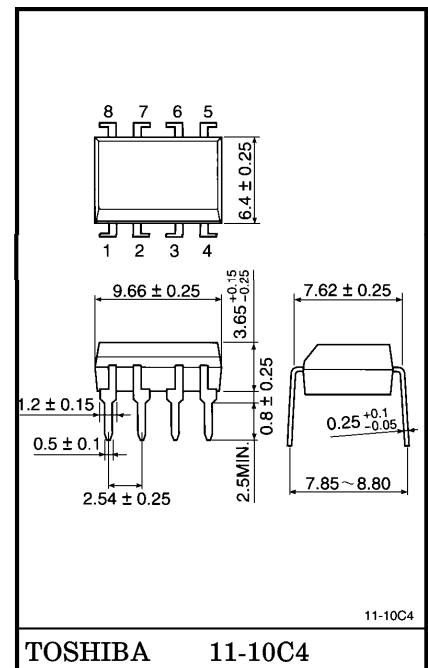
The TOSHIBA TLP2631 dual photocoupler consists of a pair of GaAs light emitting diode and integrated high gain, high speed photodetector.

This unit is 8-lead DIP.

The output of the detector circuit is an open collector, Schottky clamped transistor.

A Faraday shield integrated on the photodetector chip reduces the effects of capacitive coupling between the input LED emitter and the high gain stages of the detector. This provides an effective common mode transient immunity of 1000V/μs.

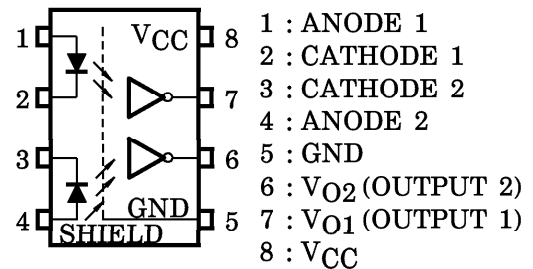
Unit in mm



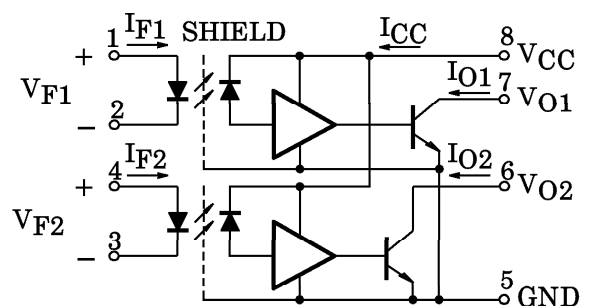
Weight : 0.54g

- Input Current Threshold : $I_F = 5\text{mA (MAX.)}$
- Switching Speed : 10MBd (TYP.)
- Common Mode Transient Immunity : $\pm 1000\text{V} / \mu\text{s (MIN.)}$
- Guaranteed Performance Over Temperature : 0~70°C
- Isolation Voltage : 2500V_{rms} (MIN.)
- UL Recognized : UL1577, File No. E67349

PIN CONFIGURATION (TOP VIEW)



SCHEMATIC



TRUTH TABLE (Positive Logic)

| INPUT | OUTPUT |
|-------|--------|
| H | L |
| L | H |

A 0.01 to 0.1μF bypass capacitor must be connected between pins 8 and 5 (See Note 1).

MAXIMUM RATINGS (No derating required up to 70°C)

| CHARACTERISTIC | | SYMBOL | RATING | UNIT |
|---|---|-----------|---------|------------------|
| LED | Forward Current (Each Channel) | I_F | 20 | mA |
| | Pulse Forward Current (Each Channel)* | I_{FP} | 30 | mA |
| | Reverse Voltage (Each Channel) | V_R | 5 | V |
| DETECTOR | Output Current (Each Channel) | I_O | 16 | mA |
| | Output Voltage (Each Channel) | V_O | -0.5~7 | V |
| | Supply Voltage (1 Minute Maximum) | V_{CC} | 7 | V |
| | Output Collector Power Dissipation (Each Channel) | P_O | 40 | mW |
| Operating Temperature Range | | T_{stg} | -55~125 | °C |
| Storage Temperature Range | | T_{opr} | -40~85 | °C |
| Lead Soldering Temperature (10s)** | | T_{sol} | 260 | °C |
| Isolation Voltage (AC, 1min., R.H. ≤ 60%, Note 3) | | BV_S | 2500 | V _{rms} |

* $t \leq 1$ msec Duration.

** 2mm below seating plane.

RECOMMENDED OPERATING CONDITIONS

| CHARACTERISTIC | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|---|-----------|------|------|------|---------|
| Input Current, Low Level, Each Channel | I_{FL} | 0 | — | 250 | μA |
| Input Current, High Level, Each Channel | I_{FH} | 6.3* | — | 20 | mA |
| Supply Voltage, Output | V_{CC} | 4.5 | 5 | 5.5 | V |
| Fan Out (TTL Load, Each Channel) | N | — | — | 8 | |
| Operating Temperature | T_{opr} | 0 | — | 70 | °C |

* 6.3mA is a guard banded value which allows for at least 20% CTR degradation.
Initial input current threshold value is 5.0mA or less.

ELECTRICAL CHARACTERISTICS (Ta = 0~70°C, Unless otherwise noted)

| CHARACTERISTIC | SYMBOL | TEST CONDITION | MIN. | TYP.* | MAX. | UNIT |
|---|---------------------------|--|-----------------------------|------------------|------|----------|
| Input Forward Voltage (Each Channel) | V _F | I _F = 10mA, Ta = 25°C | — | 1.65 | 1.75 | V |
| Input Diode Temperature Coefficient (Each Channel) | $\Delta V_F / \Delta T_a$ | I _F = 10mA | — | -2.0 | — | mV / °C |
| Input Reverse Breakdown Voltage (Each Channel) | BV _R | I _R = 10 μ A, Ta = 25°C | 5 | — | — | V |
| Input Capacitance (Each Channel) | C _T | V _F = 0, f = 1MHz | — | 45 | — | pF |
| High Level Output Current (Each Channel) | I _{OH} | V _{CC} = 5.5V, V _O = 5.5V I _F = 250 μ A | — | 1 | 250 | μ A |
| Low Level Output Voltage (Each Channel) | V _{OL} | V _{CC} = 5.5V, I _F = 5mA I _{OL} (Sinking) = 13mA | — | 0.4 | 0.6 | V |
| High Level Supply Current (Both Channels) | I _{CCH} | V _{CC} = 5.5V, I _F = 0 | — | 14 | 30 | mA |
| Low Level Supply Current (Both Channels) | I _{CCL} | V _{CC} = 5.5V, I _F = 10mA | — | 24 | 38 | mA |
| Isolation Voltage | R _S | V _S = 500V, R.H. \leq 60% (Note 3) | 5 \times 10 ¹⁰ | 10 ¹⁴ | — | Ω |
| Capacitance (Input-Output) | C _S | f = 1MHz (Note 3) | — | 0.6 | — | pF |
| Input-Input Leakage Current | I _{I-I} | R.H. \leq 60%, t = 5s V _{I-I} = 500V (Note 6) | — | 0.005 | — | μ A |
| Resistance (Input-Input) | R _{I-I} | V _{I-I} = 500V (Note 6) | — | 10 ¹¹ | — | Ω |
| Capacitance (Input-Input) | C _{I-I} | f = 1MHz (Note 6) | — | 0.25 | — | pF |

* All typical values are at V_{CC} = 5V, Ta = 25°C.

SWITCHING CHARACTERISTICS ($T_a = 25^\circ\text{C}$, $V_{CC} = 5\text{V}$)

| CHARACTERISTIC | SYMBOL | TEST CIRCUIT | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---------------|--------------|---|-------|--------|------|--------------------------|
| Propagation Delay Time to Low Output Level | t_{pHL} | 1 | $I_F = 0 \rightarrow 7.5\text{mA}$, $R_L = 350\Omega$ $C_L = 15\text{pF}$ (Each Channel) | — | 60 | 75 | ns |
| Propagation Delay Time to High Output Level | t_{pLH} | 1 | $I_F = 7.5\text{mA} \rightarrow 0$, $R_L = 350\Omega$ $C_L = 15\text{pF}$ (Each Channel) | — | 60 | 75 | ns |
| Output Rise time, Output Fall time (10~90%) | t_r , t_f | 1 | $I_F = 0 \Rightarrow 7.5\text{mA}$, $R_L = 350\Omega$ $C_L = 15\text{pF}$ (Each Channel) | — | 30 | — | ns |
| Common Mode Transient Immunity at High Output Level | CM_H | 2 | $I_F = 0$, $R_L = 350\Omega$ $V_{CM} = 400\text{V}$, $V_O (\text{MIN.}) = 2\text{V}$ (Each Channel, Note 4) | 1000 | 10000 | — | $\text{V} / \mu\text{s}$ |
| Common Mode Transient Immunity at Low Output Level | CM_L | 2 | $I_F = 7.5\text{mA}$, $R_L = 350\Omega$ $V_{CM} = 400\text{V}$ $V_O (\text{MAX.}) = 0.8\text{V}$ (Each Channel, Note 5) | −1000 | −10000 | — | $\text{V} / \mu\text{s}$ |

(Note 1) 2mm below seating plane

(Note 2) The V_{CC} supply voltage to each TLP2631 isolator must be bypassed by a $0.01\mu\text{F}$ capacitor or larger. This can be either a ceramic or solid tantalum capacitor with good high frequency characteristic and should be connected as close as possible to the package V_{CC} and GND pins each device.

(Note 3) Device considered a two-terminal device : Pins 1, 2, 3 and 4 shorted together, and Pins 5, 6, 7 and 8 shorted together.

(Note 4) CM_H · The maximum tolerable rate of rise of the common mode voltage to ensure the output will remain in the high state (i.e., $V_{OUT} > 2.0\text{V}$).

Measured in volts per microsecond ($\text{V} / \mu\text{s}$).

Volts/microsecond can be translated to sinusoidal voltages :

$$\text{V} / \mu\text{s} = \frac{(dV_{CM})}{dt} \text{Max.} = f_{CM} V_{CM} (\text{p.p.})$$

Example :

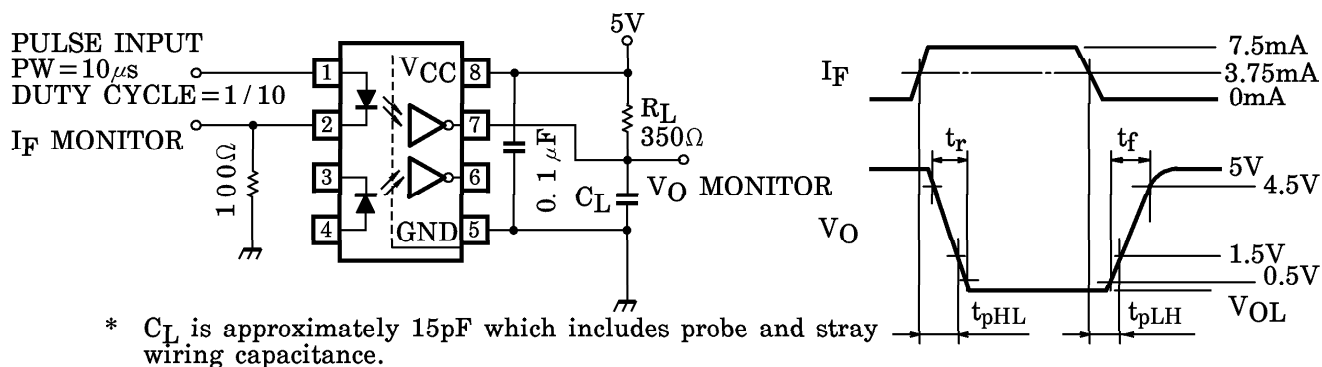
$V_{CM} = 319\text{V}_{pp}$ when $f_{CM} = 1\text{MHz}$ using CM_L and $CM_H = 1000\text{V} / \mu\text{s}$ data sheet specified minimum.

(Note 5) CM_L · The maximum tolerable rate of fall of the common mode voltage to ensure the output will remain in the low output state (i.e., $V_{OUT} > 0.8\text{V}$).

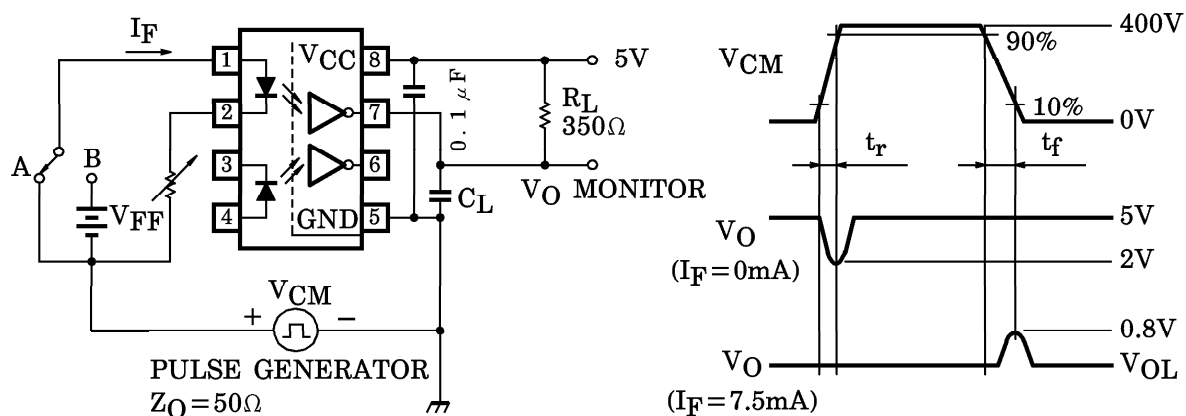
Measured in volts per microsecond ($\text{V} / \mu\text{s}$).

(Note 6) Measured between pins 1 and 2 shorted together, and pins 3 and 4 shorted together.

TEST CIRCUIT 1. t_{pHL} and t_{pLH}

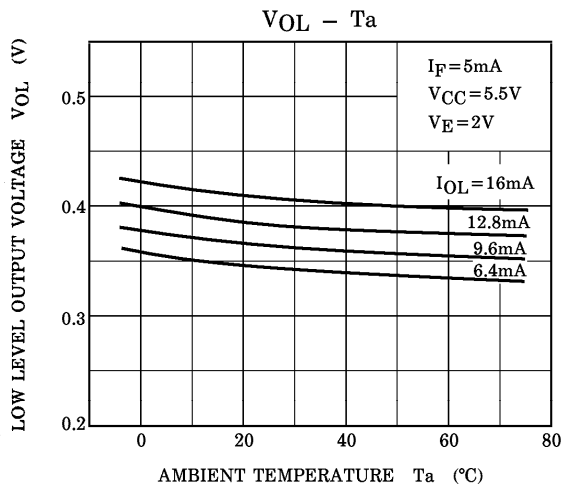
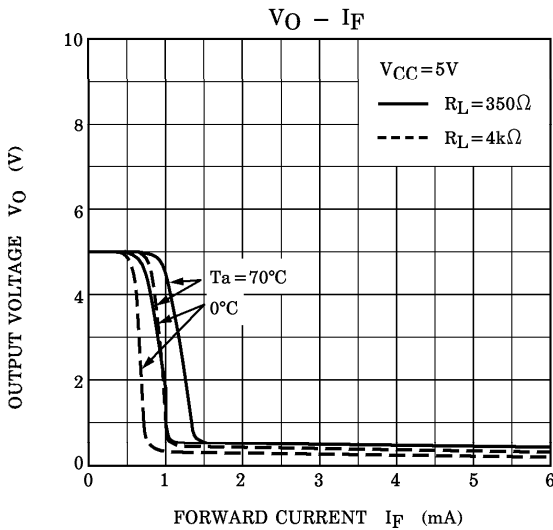
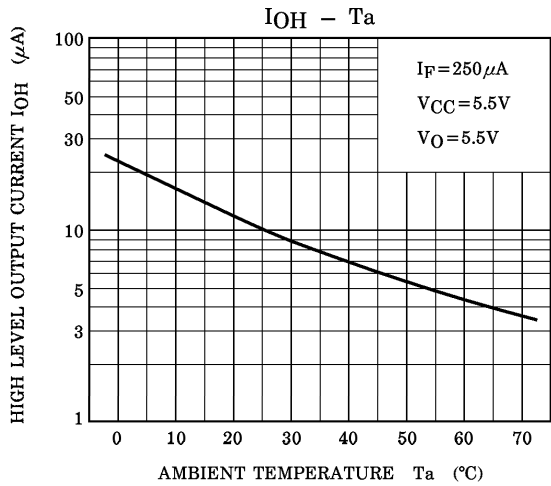
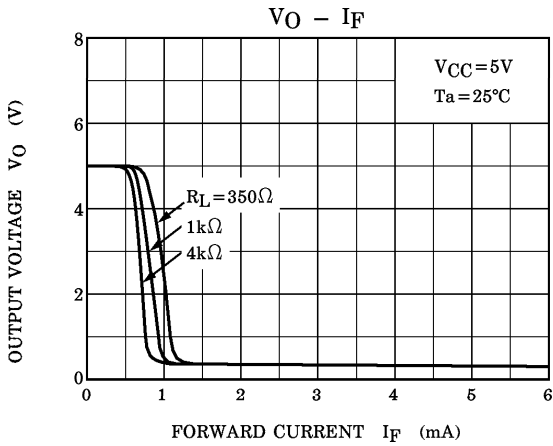
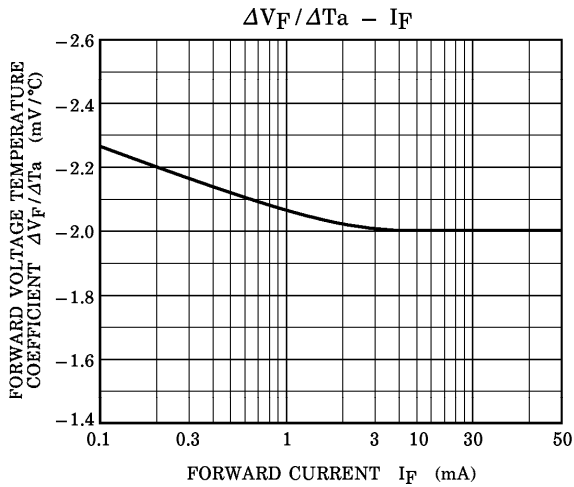
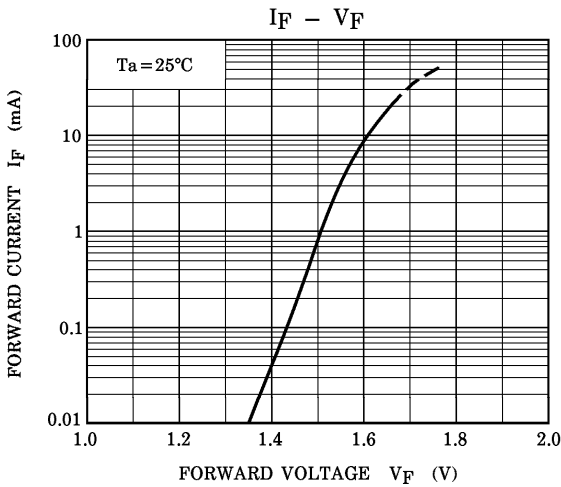


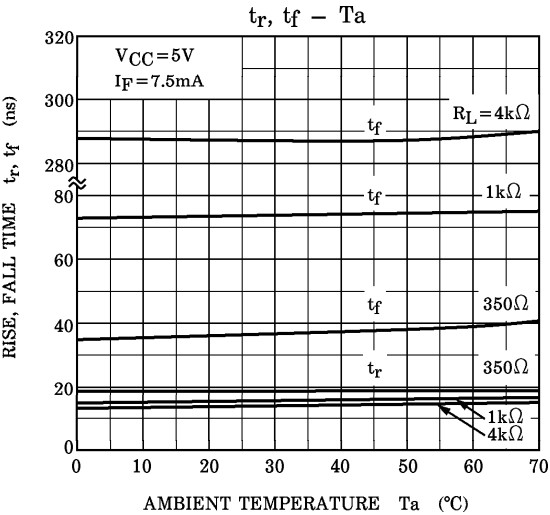
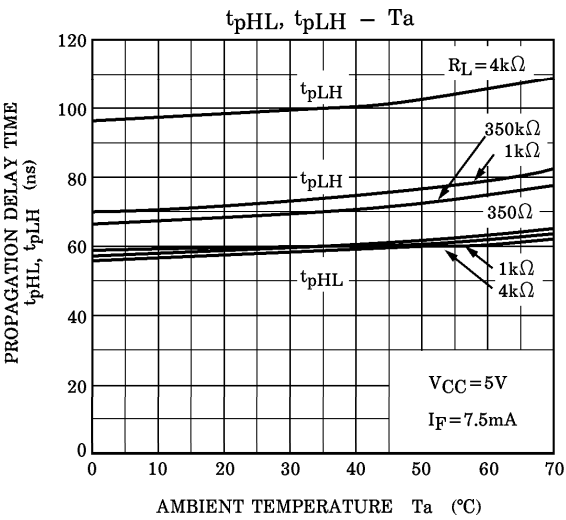
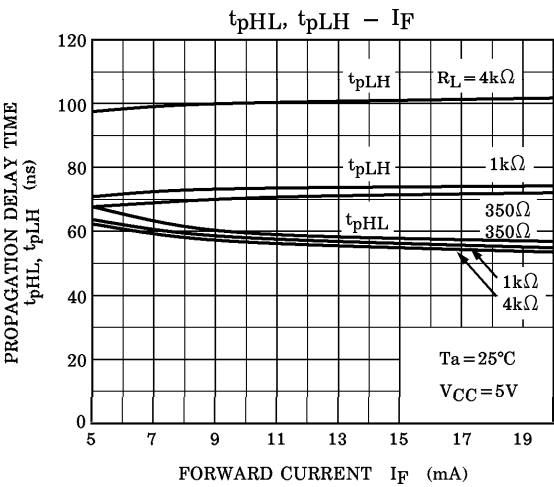
TEST CIRCUIT 2. Transient Immunity and Typical Waveforms.



$$CM_H = \frac{320(V)}{t_r(\mu s)}, CM_L = \frac{320(V)}{t_f(\mu s)}$$

* C_L is approximately 15pF which includes probe and stray wiring capacitance.





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